

## PATENT COOPERATION TREATY

## PCT

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 10469-WO	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE 2003 /001446	International filing date (day/month/year) 16.09.2003	Priority date (day/month/year) 17.09.2002
International Patent Classification (IPC) or national classification and IPC C1011/10, C10110/04		
Applicant SystemSeparation Sweden AB et al		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ (sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

- This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application   |

Date of submission of the demand  01.04.2004	Date of completion of this report  20.12.2004
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# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003 /001446

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
  - ☐ the international application as originally filed/furnished
  - ☒ the description:
    - pages 1 - 31 \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☒ the claims:
    - pages \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19
    - pages\* 32 - 35 received by this Authority on 15.12.2004
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☐ the drawings:
    - pages \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
  - ☐ the description, pages \_\_\_\_\_
  - ☒ the claims, Nos. 14 \_\_\_\_\_
  - ☐ the drawings, sheets/figs \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - ☐ the description, pages \_\_\_\_\_
  - ☐ the claims, Nos. \_\_\_\_\_
  - ☐ the drawings, sheets/figs \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2003 /001446

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-11</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-11</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-11</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

Amended claims 1-13 were filed on 15 December 2004.

Documents cited as being of particular relevance:

D1 US 3067018

D2 US 3205053

D3 US 5637118

D4 GB 1459032

The invention relates to a fuel additive composition for the reduction/removal of vanadium-containing ash deposits in gas turbines and other by combustion of vanadium-containing fuel driven apparatuses, which composition as its active ingredient comprises a compound of a metal capable of forming a vanadate with vanadium.

D1 is considered to be the closest prior art.

D1 (e.g. column 1, line 71 - column 2, line 3; column 2, lines 10-12; column 4, lines 27-53) shows that the addition of a dispersion of an oxygen-containing compound which forms vanadate, reduces vanadium-containing ash deposits and thus solves the same problem as the invention. The most preferred interval, 0,1 to 1 micron, is mentioned in D1 as particularly favourable (column 2, lines 6-11).

.../...

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.  
Continuation of: BOX V

According to the applicant, the expression "...comprising as the active ingredient..." in claim 1 of the application (page 32, lines 9-13) is to be understood as that the active ingredient consists only of "an inorganic oxygen-containing compound of said metal in particulate form" and that no other substance is involved. D1 discloses an active ingredient that in addition contains magnesium sulfonate dissolved in oil (column 6, lines 10-13 and claim 1 and 5). Thus, the composition of claim 1 according to first alternative (a1)) mentioned in the claim is novel in regard to D1.

The corresponding metal oxide according to the second alternative (a2)) having a specified density is also novel in regard to D1.

The process of claim 10 is also novel in regard to D1.

There is no disclosure in D1 of an additive without the magnesium sulfonate. It is not considered to be obvious to exclude the magnesium sulfonate from the additive disclosed by D1.

The stated differences imply improvements in providing a fuel additive composition containing a high concentration of magnesium or other metal capable of forming vanadates having a melting point above that of vanadium pentoxide.

The claims 1-13 are considered to involve an inventive step and also to fulfil the criteria of industrial applicability.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 1 should be specified further so that it is clear from the claim that the active ingredient, according to the first alternative (a1)) stated in claim 1, exclusively consists of "an inorganic oxygen-containing compound of said metal in particulate form".

Claim 4 defines the invention by a result to be achieved and therefore lacks clarity (PCT Guidelines 5.35; PCT Article 6).

C L A I M S

1. Fuel additive composition for the reduction/removal of  
vanadium-containing ash deposits in gas turbines and  
other by combustion of vanadium-containing fuel driven  
apparatuses, which composition as its active ingredient  
comprises a compound of a metal capable of forming a va-  
nadate with vanadium of said ash deposits, which compo-  
sition comprises

a) as the active ingredient either a1) an inorganic  
oxygen-containing compound of said metal in parti-  
cle form, which oxygen-containing compound, when  
heated up in a combustion flame, liberates a gase-  
ous substance by evaporation and forms the corre-  
sponding metal oxide having a crystalline porous  
low density structure or a2) said corresponding  
metal oxide having a crystalline porous low density  
structure, said inorganic oxygen-containing com-  
pound a1) and said corresponding metal oxide a2)  
having a particle size distribution essentially  
within the range of from 0,1 to 2 micron, prefera-  
bly from 0,1 to 1 micron and said corresponding  
metal oxide a2) having a density of at most 2.0  
g/cm<sup>3</sup>,

dispersed in

b) at least one liquid selected from the group con-  
sisting of liquids soluble in oil,

by means of

c) at least one dispersant selected from the group  
consisting of low molecular weight dispersants and  
high molecular weight dispersants.

2. Fuel additive composition according to claim 1, wherein  
said metal is capable of forming vanadates having a

melting point within the range of from 650°C to 2000°C.

3. Fuel additive composition according to any of claims 1 and 2, wherein said metal is magnesium or yttrium.

- 5 4. Fuel additive composition according to any of claims 1 to 3, wherein said inorganic oxygen-containing metal compounds or oxide has a particle size distribution which is adapted to be most effective at the temperature  
10 at which a solid, porous metal vanadate is formed and to form ash particles which deposit as little as possible and form as loose deposits as possible.

- 15 5. Fuel additive composition according to any of claims 1 to 4, wherein said liquid is selected from the group consisting of mineral oils, highly aromatic naphtha, diesel fuel, vegetable oils, esterified vegetable oils, animal oils and esterified animal oils.

- 20 6. Fuel additive composition according to claim 5, wherein said vegetable oils and esters thereof are selected from peanut oil, coconut oil, corn oil, linseed oil, rape-oil, palm oil, sunflower oil, olive oil, tall oil and esters thereof.

- 25 7. Fuel additive composition according to claim 5, wherein said liquid is rape-oil methyl ester or diesel fuel.

- 30 8. Fuel additive composition according to any of claims 1 to 7, wherein said inorganic oxygen-containing metal compound or oxide comprises from 10 to 65% by volume, preferably from 20 to 50% by volume and more preferably from 30 to 40% by volume, and most preferably from 40 to 50% by volume, calculated on the total volume of the  
35 composition.

9. Fuel additive composition according to any of claims 1 to 8, wherein said at least one dispersant is an anionic

or amphoteric low molecular weight dispersant.

10. Process for the preparation of a fuel additive composition as defined in any of claims 1-8, which process comprises

5  
10 mixing a powder of an inorganic oxygen-containing compound of a metal capable of forming a vanadate with vanadium of ash deposits from vanadium-containing fuel and which inorganic oxygen-containing compound when heated up in a combustion flame liberates a gaseous substance by evaporating to form to the corresponding oxide having a crystalline porous low density structure or a powder of said oxide having a crystalline porous low density  
15 structure into a mixture of at least one liquid selected from the group consisting of liquids soluble in oil with at least one dispersant for said inorganic oxygen-containing metal compound or oxide selected from the group consisting of low molecular weight dispersants and  
20 high molecular weight dispersants using shear forces to form a homogenous pumpable premix and

25 subjecting the premix to a treatment comprising size degradation and dispersant coating to a particle size distribution of the inorganic oxygen-containing metal compound and oxide essentially within the range of from 0.1 to 2 micron, preferably from 0.1 to 1 micron, under centrifugal or oscillation forces in the presence of a grinding medium and/or ultrasonic treatment until a plot  
30 of the sediment height in samples taken periodically during said treatment and centrifuged at a fixed rate for a fixed period versus time plateaus and the viscosity has decreased and come into a steady state.

- 35 11. Process according to claim 10, wherein the size degradation and dispersant coating is carried out in a basket mill with zirconium balls as a grinding medium.



12. Process according to claim 11, wherein size degradation and dispersant coating is carried out at an accelerative force within the range of from 50g to 70g on the liquid.
- 5 13. Process according to any of claims 11 and 12, wherein only part of said at least one liquid and/or said at least one dispersant has been used when preparing the mixture of said at least one liquid soluble in oil and said at least one dispersant, the remainder of the dis-
- 10 persant and liquid being added after said graph over the sediment height in samples taken periodically and being centrifuged at a fixed rate for a fixed period has reached a plateau.